

## **ABSTRACT**

Crystalline colloidal arrays (CCA) which have been encapsulated in a polymer matrix to produce more robust polymerized crystalline colloidal arrays (PCCA) are provided. The PCCA's of the present invention can be in the form of a hydrogel which can be compatible for use with a biological system. The polymer matrix of the PCCA is formed of polymerized poly(ethylene glycol) based monomer units which can provide a desired functionality to the PCCA. The PCCA can be formed to exhibit a photonic bandgap at a certain wavelength. The photonic bandgap can be capable of shifting upon some form of environmental stimulation rendering the PCCA suitable for many optical applications, including active photonic switching and sensory applications.